

NOTE.—The Association desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to but does not purport to comprise all the necessary provisions of a contract.

British Engineering Standards Association.

Incorporated by Royal Charter 1929.

British Standard Specification for Aircraft Material.

CAST IRON PISTON RING POTS.

(Sand Cast and Chill Cast).

1. **Chemical Composition.** (a) The iron in the pots shall have the following composition :—

	Sand Castings.	Chill Castings.
Total Carbon - - -	Not more than 3·5 per cent. -	Not more than 3·5 per cent.
*Combined Carbon - - -	Between 0·55 & 0·80 per cent. -	Between 0·45 & 0·80 per cent.
Silicon - - -	Not more than 1·8 per cent. -	„ 1·8 & 2·5 per cent.
*Sulphur - - -	„ „ „ 0·12 per cent. -	Not more than 0·12 per cent.
Phosphorus - - -	„ „ „ 1·0 per cent. -	„ „ „ 1·0 per cent.
Manganese - - -	Between 0·4 & 1·2 per cent. -	Between 0·4 & 1·2 per cent.

* In cases of doubt the chemical determination of the Combined Carbon shall be made by the combustion method and that of the Sulphur by the gravimetric method.

(b) The manufacturer shall supply, wherever possible, the analysis of the pots to the Inspector who may also take samples and have them analysed, the results to be available to the manufacturer.

(c) Before samples for analysis are taken from any pot, the pot shall be turned down at the end which is to be sampled to a diameter approximately equal to that of the rough machined rings which are to be made therefrom. The drillings or turnings for chemical analysis shall be taken from the metal which remains after this machining has been carried out. As an alternative the pots may be drilled parallel to their axis in the centre of the thickness of the casting with a drill whose diameter is approximately equal to the thickness of the finished ring. The whole of the samples after drilling or turning shall be sieved in a 30 mesh sieve. The parts which pass the sieve and the parts which do not shall be weighed and proportionate parts taken for each determination.

(d) The sample for chemical analysis shall be taken from one of the pots selected for mechanical test (see Clause 5). Should this fail to come within the limits of chemical composition specified, a further two pots shall be taken from the same group, and if one of these fails the whole of the castings represented shall be rejected at the discretion of the Inspector, or he may direct further samples to be taken. If the second samples are satisfactory the whole of the pots shall be accepted.

2. **Freedom from Defects.** The pots shall be sound and free from blowholes and all surface and other defects. They shall be to the dimensions specified within reasonable limits and capable of being machined to the finished dimensions without leaving any evidence of the black surface.

In the case of chilled castings the outside diameter should be such that the whole of the chilled portion is removed by the rough machining operations on the pot.

3. **Tensile Test.** (a) The following test shall be carried out in the presence of the Inspector and to his satisfaction.

(b) A test ring cut from the pot, as specified in Clause 5, to an approximately square section or to a section approximating to that of the finished ring shall be split and pulled apart in a testing machine by a load applied at opposite ends of the diameter which is at right angles to that through the gap. It must withstand a stress of at least 16 tons per square inch (25·20 kg. per mm².) before fracture, calculated by the use of the following formula :—

$$S = \frac{PD}{1200 b t^2}$$

where

S = Stress in tons per sq. in.

D = External diameter of the unsplit ring in inches.

P = Load in lb.

b = Width of ring in inches.

t = Radial Thickness of ring in inches.

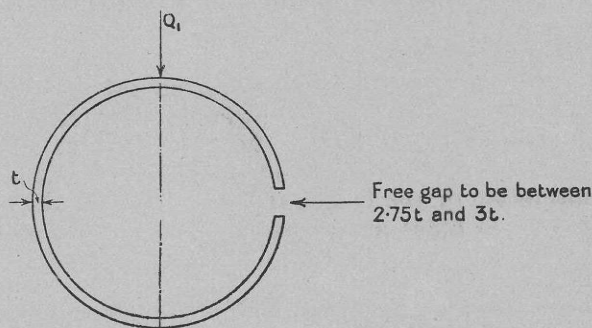
4. **Elasticity Test.** A test ring shall be machined from the pot, as specified in Clause 5, to a thickness of not less than $\frac{\text{Diameter (uncut)}}{34}$ and a piece cut out of the ring so as to leave a free gap of not less than 2·75 t and not more than 3 t. The width (b) and the radial thickness (t) shall then be determined and a diametral load (Q₁) lb. sufficient to close the gap to less than 0·25 t shall be applied. The change in gap (δ₁) and the mean external diameter of the closed ring (d) shall be measured and shall be such that E_n, when calculated from the following formula, is not less than 15·5 × 10⁶ lb. per sq. inch.

$$E_n = \frac{5\cdot37 \left(\frac{d}{t} - 1 \right)^3 Q_1}{b\delta_1}$$

The mean external diameter (d) of the ring in the closed position shall be calculated from the measurement of its circumference taken by means of a calibrated tape or such equivalent method.

Furthermore, in order to remove a degree of permanent set from the ring and thus obtain uniform and strictly comparable values of E_n, the change of gap shall be measured on a second test, viz., after the ring has once been closed, allowed to open and again closed.

The manner of applying the load Q₁ is illustrated by the following sketch :—



5. **Selection and Preparation of Test Rings.** (a) Three pots shall be selected at random from each day's cast by the Inspector and one test ring shall be cut from each pot. Should any ring fail to fulfil the tests specified in Clauses 3 and 4 two other rings may be cut from the same pot and the test or tests repeated. If either of these test rings fail then the Inspector may (a) reject all the pots represented by the day's cast or (b) take one tensile and one elasticity test from each pot in the day's cast or (c) make such other arrangements with the manufacturer for increased testing as he may consider necessary.

Test rings and samples for analysis for other than centrifugally cast pots shall be cut approximately from the middle of the length of the selected pot.

Test rings and samples for analysis for centrifugally cast pots shall be cut at any point not less than $\frac{1}{4}$ inch (6.35 mm.) from the end of the selected pot.

In no case shall the test ring be hammered or otherwise treated before testing.

6. **Marking.** All material passed by the Inspector shall be marked with a stamp bearing the Specification Number and the identification mark of the Inspector.

This Specification was adopted by the Sectional Aircraft Committee on 12th September, 1928, and approved on behalf of the Main Committee on 24th September, 1928.

NOTE.

In order to keep abreast of progress in the Industries concerned, the British Standard Specifications are subjected to periodical review.

Suggestions for improvements, addressed to the Director of the British Engineering Standards Association, 28 Victoria Street, London, S.W., 1, will be welcomed at all times. They will be recorded and in due course brought to the notice of the Committees charged with the revision of the Specifications to which they refer.